**2015 Field Season: Outline for Chautauqua Lake Research**

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Draft 10/16/14

***GENERAL RESEARCH QUESTIONS:***

1. What are normal seasonal patterns for algae and zooplankton communities in Chautauqua? (species, abundance)
2. Which species are present during harmful algal blooms?
3. What is the thermal structure of the lake? How might this influence nutrient cycling (especially phosphorus) within the system?
4. What limits primary production (photosynthesis) by algae?
5. Is this lake suitable for paleolimnological studies? Are there any preservation issues? Can we detect diatoms and fossil pigments preserved in the lake sediments?
6. How different are the two basins of Chautauqua? What factors cause biological and/or chemical variations? What might this mean for future lake management?

***RESEARCH METHODOLOGY*:**

In order to address current and future management issues within Chautauqua Lake, detailed information is needed about water quality and biological communities present in the open water portion of the lake. In particular, little is known about the phytoplankton (free-floating algae) or zooplankton (free-swimming microscopic animals) of Chautauqua Lake. These critical groups form the base of aquatic food webs, and are frequently linked with large-scale water quality issues. During the summer of 2015, I plan to gather pilot information about plankton communities and establish baseline information about the system, with the goal of developing future research projects and working with local community groups as a scientific resource during management planning.

***Contemporary ecological techniques:***

* *Bi-weekly or monthly monitoring program on Chautauqua (May – October).* Routine sampling, particularly of plankton communities, is needed to establish seasonal patterns at this site. Lake visits will include collection of information for the following parameters: vertical profiles for temperature, dissolved oxygen, conductivity, pH, and chlorophyll (Hydrolab multi-probe), secchi disk readings for water clarity, whole-water collections for nutrient analysis and plankton counts. Plankton will be identified and quantified using microscopes available at Fredonia. *(Research questions 1, 2, 3, and 6)*
* *Phytoplankton experiments (small-scale; spring, summer, fall).* Experimental assays allow detailed testing to determine what parameters actually control growth of phytoplankton. In these pilot experiments, whole-lake water will be placed into cubitainers or small water-tight bags (similar to a Ziplock-style bag) with additions of various nutrients (likely phosphorus, nitrogen, and nitrogen + phosphorus). If possible, the experiment will be incubated within the lake to maintain ambient temperature and light conditions at the site. After 7 days, samples will be collected for each treatment to assess changes in algae communities. *(Research question 4)*

***Paleolimnological techniques***

* *Collection of lake sediment core to explore past ecological changes at Chautauqua Lake.* Biological remains preserved in the sediments at the bottom of a lake provide a record of past microscopic communities that lived in the lake in the past. For the most recent century (back to 1900 AD), data can be compared to instrumental climate records to explore links between environmental conditions and biological change. Short sediment cores will be collected from each basin of Chautauqua this summer, in order to establish sedimentation rate, preliminary chronology, and preservation of biological remains – these records will focus primarily on the recent past (100-200 years). In this core, I will analyze sediments for diatoms (a special type of algae that preserves in the sediment and is very sensitive to changes in water quality), zooplankton remains, and possibly fossilized algae pigments. In addition to establishing high-resolution records of the recent past for both the north and south basins, the ultimate goal will be to determine the feasibility of collecting a long sediment core to encompass the entire history of the lake since it formed, approximately 12,000 years ago. *(Research questions 5 and 6)*

***Future goals related to Chautauqua Lake research:***

Pilot data are needed to determine whether a high-resolution monitoring buoy would be appropriate for the site. Detailed information will help formulate specific research targets and aid in technical design of a buoy system tailored for Chautauqua Lake. Additionally, as stated above, exploratory short cores are essential prior to obtaining longer sediment records.

A key goal of this project will be to interface with local interest groups in order to provide scientific information to lake managers. Community involvement and citizen science are critical to establishing successful management strategies – as such, I have discussed a few ideas with John Jablonski III of CWC, including opportunities for local outreach (e.g. “Lake-side Lab” events, where kids can collect lakewater samples and see what’s living in the lake via on-site microscopes) as well as citizen science programs (local community members engage in active research, guided by a scientist).